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Chapter 1 : State-Space Models - MATLAB & Simulink

There are always discrepancies between design models and the actual physical systems or phenomena that they model. Regardless of their source, such perturbations can degrade the performance of otherwise optimal designs. This article discusses a design strategy for models with bounded perturbations.

Kalman filtering with inequality constraints for turbofan engine health estimation by Dan Simon Donald L. Simon - IEE Proc. Kalman fllters are often used to estimate the state variables of a dynamic system. However, in the application of Kalman fllters some known signal information is often either ignored or dealt with heuristically. For instance, state variable constraints which may be based on physical considerations For instance, state variable constraints which may be based on physical considerations are often neglected because they do not flt easily into the structure of the Kalman fllter. This paper develops two an-alytic methods of incorporating state variable inequality constraints in the Kalman fllter. The flrst method is a general technique of using hard constraints to enforce inequalities on the state variable estimates. The resultant fllter is a combination of a standard Kalman fllter and a quadratic programming problem. The second method uses soft constraints to estimate state variables that are known to vary slowly with time. Soft constraints are constraints that are required to be approximately satis-fled rather than exactly satisfled. The incorporation of state variable constraints increases the computational efiort of the fllter but signiflcantly improves its estima-tion accuracy. The improvement is proven theoretically and shown via simulation Show Context Citation Context Enhancements to rss based indoor tracking systems using kalman filters by I. This paper describes the site survey issues when deploying a wireless local area network WLAN , the implementation of a location system over the deployed network, and the application of a Kalman filtering algorithm to enhance the tracking performance. We have made a site survey in the Electrical an Ekahau Positioning Engine [1] was used to find the coverage areas of all available access points throughout the building. After having the network up and running, the signal strength values at certain locations are recorded and an indoor propagation analysis is made. A nearest neighbors algorithm and its variants are used to construct a location system and possible ways of improvements are discussed. Improvements in the estimation error using a Kalman filter algorithm are then presented. Show Context Citation Context The EM algorithm is another possible approach for finding the parameters of the mixture model that might have produced the measurements. There are also other navigational algorithms that make use of Voss, Jens Timmer , " We review the problem of estimating parameters and unobserved trajectory components from noisy time series measurements of continuous nonlinear dynamical systems. It is first shown that in parameter estimation techniques that do not take the measurement errors explicitly into account, like regressio It is first shown that in parameter estimation techniques that do not take the measurement errors explicitly into account, like regression approaches, noisy measurements can produce inaccurate parameter estimates. Another problem is that for chaotic systems the cost functions that have to be minimized to estimate states and parameters are so complex that common optimization routines may fail. We show that the inclusion of information about the time-continuous nature of the underlying trajectories can improve parameter estimation considerably. Two approaches, which take into account both the errors-in-variables problem and the problem of complex cost functions, are described in detail: Both are demonstrated on numerical examples. Abstract â€" OFDM modulation combines the advantages of high achievable rates and relatively easy implementation. However, for proper recovery of the input, the OFDM receiver needs accurate channel information. In this paper, we propose an expectation-maximization EM algorithm for joint channel and In this paper, we propose an expectation-maximization EM algorithm for joint channel and data recovery in fast fading environments. The algorithm makes a collective use of the data and channel constraints inherent in the communication problem. This comes in contrast to other works which have employed these constraints selectively. The data constraints include pilots, the cyclic prefix, and the finite alphabet restriction, while the channel constraints include sparsity, finite delay spread, and the statistical properties of the channel frequency and time correlation. The algorithm boils down to a forward-backward FB Kalman filter. We also suggest a suboptimal modification that is able to track the channel and recover the data with no latency. Simulations show the favorable behavior of both algorithms compared to other channel estimation techniques. However, the receiver can be generalized to estimate the state-space parameters and to be robust to uncertainties in these estimates e. This paper addresses the state estimation of a class of continuous-time systems with implicit outputs. To avoid weighting the distant past as much as the present, a forgetting factor is also introduced. We show that, under appropriate observability assumptions, the optimal estimate converges globally asymptotically to the true value of the state in the absence of noise and disturbance. In the presence of noise, the estimate converges to a neighborhood of the true value of the state. We apply these results to the estimation of position and attitude of an autonomous vehicle using measurements from an inertial measurement unit IMU and a monocular charged-coupled-device Show Context Citation Context Game theoretical versions of these estimators were pr Minimax state estimation for linear discrete-time differential-algebraic equations by Sergiy M. Zhuk - Automatica J. IFAC , " This paper presents a state estimation approach for an uncertain linear equation with a non-invertible operator in Hilbert space. The approach addresses linear equations with uncertain deterministic input and noise in the measurements, which belong to a given convex closed bounded set. A new notion of a minimax observable subspace is introduced. By means of the presented approach, new equations describing the dynamics of a minimax recursive estimator for discrete-time non-causal differential-algebraic equations DAEs are presented. The properties of the estimator are illustrated by a numerical example. Jyvaskyla, Finland, May , A basic notion in the theory of set-membership state estimation is that of an a posteriori s

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Chapter 2 : CiteSeerX â€" A Framework for State-Space Estimation with Uncertain Models

Abstract: Develops a framework for state-space estimation when the parameters of the underlying linear model are subject to uncertainties. Compared with existing robust filters, the proposed filters perform regularization rather than deregularization. It is shown that, under certain stabilizability.

Generate data from a known model, and then fit a state-space model to the data. Suppose that a latent process is this AR 1 process where is Gaussian with mean 0 and standard deviation 1. Generate a random series of observations from , assuming that the series starts at 1. Use the random latent state process x and the observation equation to generate observations. Supposing that the coefficients and variances are unknown parameters, the state-space model is Specify the state-transition matrix. Use NaN values for unknown parameters. Also, specify the initial state mean, variance, and distribution which is stationary. Verify that the model is correctly specified using the display in the Command Window. Pass the observations to estimate to estimate the parameter. Set a starting value for the parameter to params0. Specify that the lower bound of is -Inf. Maximum likelihood fmincon Sample size: Initial state means x1 0 Initial state covariance matrix x1 x1 10 State types x1 Stationary EstMdl is an ssm model. The results of the estimation appear in the Command Window, contain the fitted state-space equations, and contain a table of parameter estimates, their standard errors, t statistics, and p-values. Use dot notation to use or display the fitted state-transition matrix. Suppose further that the first difference of the unemployment rate is an ARMA 1,1 series. Symbolically, and in state-space form, the model is where: Load the Nelson-Plosser data set, which contains the unemployment rate and nGNP series, among other things. Also, remove the starting NaN values from each series. However, using the Kalman filter framework, the software can accommodate series containing missing values. Specify the state-transition coefficient matrix. Display the estimates and all optimization diagnostic information. Restrict the estimate of to all positive, real numbers.

Chapter 3 : Maximum likelihood parameter estimation of state-space models - MATLAB

A fundamental assumption in the Kalman filter is that the underlying state-space model is accurate and does not contain uncertainties. When this condition is violated, the performance of the.

Chapter 4 : CiteSeerX â€" Citation Query A Framework for State-Space Estimation with Uncertain Models

This paper presents a state estimation approach for an uncertain linear equation with a non-invertible operator in Hilbert space. The approach addresses linear equations with uncertain deterministic input and noise in the measurements, which belong to a given convex closed bounded set.